Microfossils in the Deep

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Oceanography 101

Research Question & Background

What is the distribution of microfossils in the subsurface sediments of the Scott Plateau (site U1483)? “International Ocean Discovery Program Expedition 363 sought to document the regional expression and driving mechanisms of climate variability.”(Y. Rosenthal et al., Summary, pg.1) The Scott Plateau is an oceanic plateau located off the northwestern coast of Australia, in the Indian Ocean. It's situated on the Northwest Australian Margin, west of the Browse Basin. The plateau lies in relatively deep water, ranging from about 300 to 3500 meters. It's a submerged fragment of continental crust that separated from the Australian mainland millions of years ago. It covers a significant area, roughly 160,000 square kilometers. The Scott Plateau is characterized by its flat top and steep sides, and it's dissected by several canyons. Microfossils, the tiny remains of ancient organisms, can provide valuable clues about past environments and geological events. This research investigates the distribution of microfossils in subsurface sediments at three locations in the Scott Plateau. By analyzing the types and abundance of microfossils at different depths, we aim to reconstruct the environmental and geological history of the area. (J. Lipps, 2025)

Past water depths : The presence of silica microfossils may indicate deeper water environments, while calcium carbonate microfossils suggest shallower conditions.

Salinity: Calcium carbonate microfossils are more common in marine environments, while silica microfossils can be found in both marine and freshwater settings.

Sea-level changes: Changes in the types of microfossils found in a sediment core can indicate fluctuations in sea level over time.

Geological events: The presence or absence of certain microfossils can help identify past geological events, such as landslides, volcanic eruptions, or tectonic activity. (J. Lipps, 2025)

Methods

Materials & Location

Site U1483 collected the data from Australia by IODP in 2016, which were labeled core A, B & C. Each core had different depth (meters) samples. Then in 2018, they wrote a report and summary of their findings.

Procedure

As a team we analyzed data from 3 different depths per core, Gabby would evaluate each sample, I recorded our findings, Grace and I would take pictures of what we saw in the microscope.

Figure 1. Slide C90 - (taken at 154.02m) Sponge spicules. Silicoflagellate with diatom fragments. Foraminifera and clay.

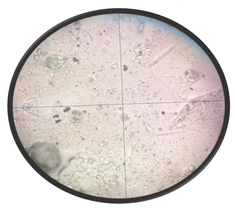

Figure 2. Slide A70 - (taken at 123.3m) Calcareous Microfossils. Foraminifera and clay.

Site U1483

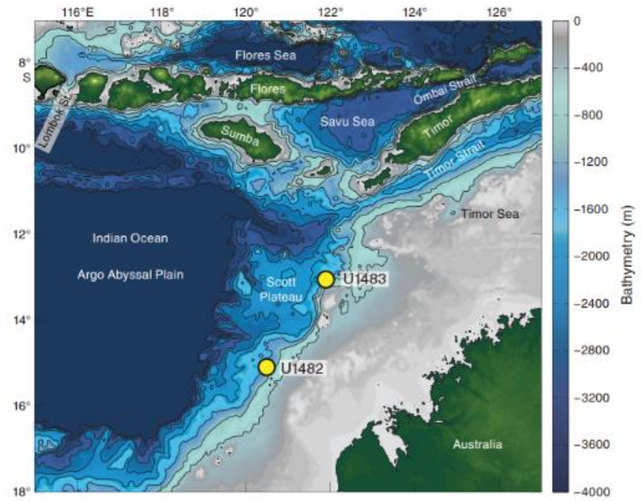

Figure L3. Bathymetic map showing location of U1483 during Expedition 363: Scott Plateau off Australia. Core A, B & C were sampled from. (Y. Rosenthal et al., Report, pg. 1)

How deep were microfossils found?

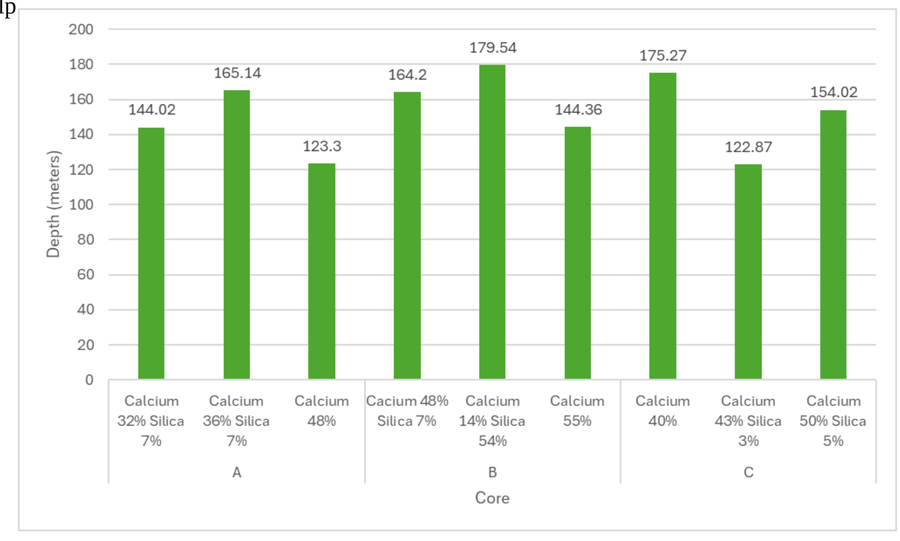

Figure T4. Microfossils found at deeper depths at each core. (Y. Rosenthal et al., Report, pg. 4-6)

Discussion

Core A: The majority of this core consists of "clay-rich foraminifer-nannofossil ooze" and "clay and foraminifer-rich nannofossil ooze." This suggests a relatively deep-water environment with lower primary productivity (less plankton growth) compared to other cores. The presence of foraminifers indicates a marine setting. Variations in CaCO3 and Reflectance suggest some fluctuations in carbonate production and potentially changes in water depth or nutrient availability. (Y. Rosenthal et al., Report, pg. 6)

Core B: This core shows the highest CaCO3 values, suggesting a period of high carbonate production and accumulation. This could indicate a shallower water depth or higher primary productivity compared to other cores. Significant variations in CaCO3 and Reflectance suggest fluctuating environmental conditions. (Y. Rosenthal et al., Report, pg. 7)

Core C: This core shows a mix of "clay-rich nannofossil ooze" and "clay and foraminifer-rich nannofossil ooze," suggesting a more variable environment compared to the other cores. The presence of pteropods (planktonic mollusks) in some layers could indicate periods of upwelling, bringing nutrient-rich waters to the surface. (Y. Rosenthal et al., Report, Pg. 8)

The combined data from the three cores suggests a dynamic environment on the Scott Plateau with fluctuations in water depth, primary productivity, and nutrient availability over time. The presence of diatoms and pteropods in certain layers suggests the influence of oceanographic currents and upwelling, bringing nutrients to the surface and supporting different plankton communities. To gain a more detailed understanding of the environmental changes represented by each core, further analysis of microfossil assemblages, stable isotopes, and other proxies would be necessary. By analyzing the characteristics of each core sample, we can piece together a more comprehensive picture of the paleoenvironmental history of the Scott Plateau and its response to various geological and oceanographic processes.

Follow up questions that came to our minds were What do these microfossils indicate about past water temperatures, salinity, and nutrient levels? How do the findings from Site U1483 contribute to our understanding of the geological history and evolution of the Scott Plateau? And how do the findings from Site U1483 relate to past climate changes, such as glacial-interglacial cycles?

Acknowledgements

Thank you to our Oceanography instructor, Monica Riess for steering us in the right direction when we were lost.

Work Cited

Y. Rosethal et al (2018).Expedition 363 summary.IODP.org

Y. Rosethal et al (2018).IODP Hole U1483 Report 1.IODP.org

J. Lipps, Microfossils, Accessed 20 Mar. 2025. https://ucmp.berkeley.edu/fosrec/Lipps1.html